

DETAILED ACTION

Response to Arguments

Applicant's arguments, see arguments, filed 5/23/2008, with respect to the rejection(s) of claim(s) 18 under 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kim.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 18-20,22,25,26,40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim [US 6,880,916].

Regarding **claim 18**, Kim discloses a nozzle plate comprising:

- a first nozzle layer having a first nozzle hole through which a liquid substance is discharged [Figure 4; plate 301];
- a second nozzle layer having a second nozzle hole that is connected to the first nozzle hole and receives the liquid substance [Figure 4; passage plate 200]; and

- a discharge layer that has an opening, provided on a liquid substance discharging side in a liquid substance flow direction of the first nozzle layer, the opening determining a diameter of a discharge opening of the liquid substance discharge side [Figure 4; plate 302]; and
- the first nozzle hole penetrating the first nozzle layer and being connected with the opening [Figure 4],
- wherein a surface of the discharge layer facing the liquid substance discharge side is flush with a surface of the first nozzle layer facing the liquid substance discharge side [plate 302 is flush with the liquid discharge side of plate 301; Figure 4].

However, Kim does not explicitly disclose the plate 302 having a higher resistance to etching than plate 301.

However, Kim does explicitly disclose the two layers can be formed of any of SiN, SiON, or SiO₂ and can be applied in any given order [Columns 5-6, Lines 66-10]. Kim discloses that SiN having a higher wet etch rate than SiO₂ and teaches the possibility of applying them in any desired order.

Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the invention of Kim, as doing so would be a design choice and could be reached via routine experimentation using a finite set of choices.

Regarding **claim 19**, Kim discloses plate 302 being formed in nozzle plate 300.

Regarding **claim 20**, Kim discloses the layer being made of SiN.

Regarding **claim 22**, Kim discloses the discharge layer being locally formed around the opening [Figure 4].

Regarding **claim 25**, Kim discloses the first nozzle layer being SiN, SiO₂ or SiON and the second nozzle layer being a polyimide.

Regarding **claim 26**, Kim discloses the general taper shaped nozzle structure [Figure 4].

Regarding **claims 40-42**, Kim discloses the necessary apparatus limitations, and as such the method of forming does not distinguish one apparatus from another.

3. Claims **23,24,27,43-49** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Gue.

Regarding claims 23,24,27,43-45, Kim fails to disclose the limitations

Regarding **claim 23**, Gue discloses a blocking layer (22) formed between first (26) and second (23) nozzle layers which has a high resistance to etching [formed of SiO₂[0099] which applicant lists as having high resistance to etching] and the first nozzle hole penetrates the blocking layer and is connected to the second nozzle hole [Figure 12]

Regarding **claim 24**, Gue discloses a blocking layer having a higher resistance to etching than the second nozzle layer [0099] and an outer shape of the blocking layer is larger than the second nozzle layer [Figure 12] and connect via hole 24 and channel 32.

Regarding **claim 27**, Gue discloses a generally taper shaped second nozzle layer [Figure 12].

Regarding **claims 43-45**, Gue discloses a cylindrical shaped opening 28 and a taper shaped opening 32 [Figure 12] and the first opening being concentric with a second opening and diameter being smaller than the first opening.

Regarding **claim 46**, Kim discloses the discharge and first nozzle layer being flush [Figure 4].

Regarding **claim 47**, Gue discloses an upper base 27 which is substantially circular [Figure 12].

Regarding **claim 49**, Kim discloses the discharge layer being formed in the nozzle plate 300 [Figure 12].

4. Claims **28,50,51** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Gue in further view of Noguchi.

Regarding claims 28,50,51, Kim fails to disclose a water repellant layer. However, Noguchi teaches a liquid repellant film formed on the outer portion of a nozzle [Figure 7]. Thus, it would have been obvious to one of ordinary skill in the art to modify the invention of Gue with the film of Noguchi, as doing so would improve liquid repellency and maintain the liquid repelling effect [Noguchi, abstract].

5. Claims **30-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Gue in further view of Agarwal.

Regarding claims **30-33**, Kim fails to disclose the claimed limitations. However, Agarwal teaches layers in a printhead formed of silicon nitride, silicon dioxide, boron

Art Unit: 2853

nitride, silicon carbide, silicon carbon dioxide, chromium, nickel, rhodium, palladium, gold, titanium, tantalum, aluminum, as well as a plurality of organic substances [Column 11]. Agarwal also teaches the selection of any given composition(s) for this purpose shall typically be undertaken in accordance with routine preliminary pilot testing taking into account the desired goals to be achieved and then matching a given composition with such goals. Thus, it would have been obvious to one of ordinary skill in the art, through routine testing and experimentation, to combine the invention of Gue with the compositions of Agarwal, as doing so would provide high efficiency orifice plate structure [Agarwal].

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark John Stevenosky, Jr. whose telephone number is (571)270-1336. The examiner can normally be reached on Monday - Friday, 9AM - 5:30PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark John Stevenosky, Jr./
Examiner, Art Unit 2853

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6/13/2008

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Primary Examiner, Art Unit 2853